

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Exam: Function Reflections (Solution version 13)**

1. Let function  $f$  be defined by the polynomial below:

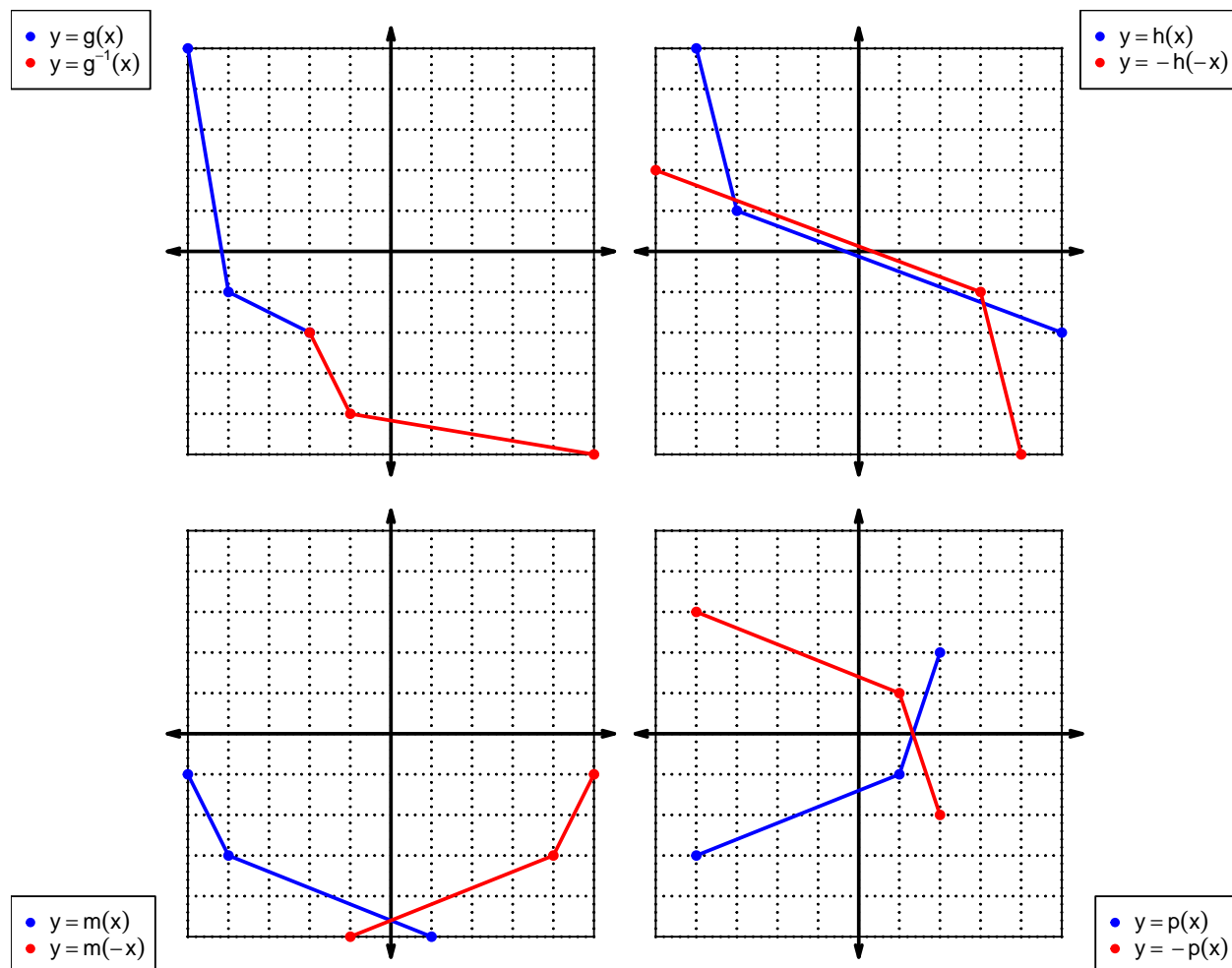
$$f(x) = 4x^5 + 6x^4 - 3x^3 + 8x^2 + 7x - 5$$

Draw lines that match each function reflection with its polynomial:

**Reflections****Polynomials**

$f(-x)$	●	●	$4x^5 - 6x^4 - 3x^3 - 8x^2 + 7x + 5$
$-f(x)$	●	●	$-4x^5 + 6x^4 + 3x^3 + 8x^2 - 7x - 5$
$-f(-x)$	●	●	$-4x^5 - 6x^4 + 3x^3 - 8x^2 - 7x + 5$

2. In each  $xy$  plane shown below, a function is graphed with blue. Draw the indicated reflections (as a second curve, indicated in legend) with black (or with whatever you have). The  $x$  axis is horizontal and the  $y$  axis is vertical (as typical), and the scale is equal on both axes.



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For all questions on this page, the functions  $f$ ,  $g$ , and  $h$  are defined by the table below.

$x$	$f(x)$	$g(x)$	$h(x)$
1	4	7	8
2	3	8	9
3	9	1	2
4	7	2	7
5	1	6	3
6	2	5	1
7	5	9	6
8	6	3	4
9	8	4	5

3. Evaluate  $g(5)$ .

$$g(5) = 6$$

4. Evaluate  $f^{-1}(9)$ .

$$f^{-1}(9) = 3$$

5. Assuming  $h$  is an **odd** function, evaluate  $h(-1)$ .

If function  $h$  is odd, then

$$h(-1) = -8$$

6. Assuming  $g$  is an **even** function, evaluate  $g(-4)$ .

If function  $g$  is even, then

$$g(-4) = 2$$

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7. A function,  $f$ , is **even** if  $f(x) = f(-x)$  for all  $x$  in the domain. A function,  $g$ , is **odd** if  $g(x) = -g(-x)$  for all  $x$  in the domain.

Let polynomial  $p$  be defined with the following equation:

$$p(x) = x^3 + x$$

- a. Express  $p(-x)$  as a polynomial in standard form.

$$p(-x) = (-x)^3 + (-x)$$

$$p(-x) = -x^3 - x$$

- b. Express  $-p(-x)$  as a polynomial in standard form.

$$-p(-x) = -(-x^3 - x)$$

$$-p(-x) = x^3 + x$$

- c. Is polynomial  $p$  even, odd, or neither?

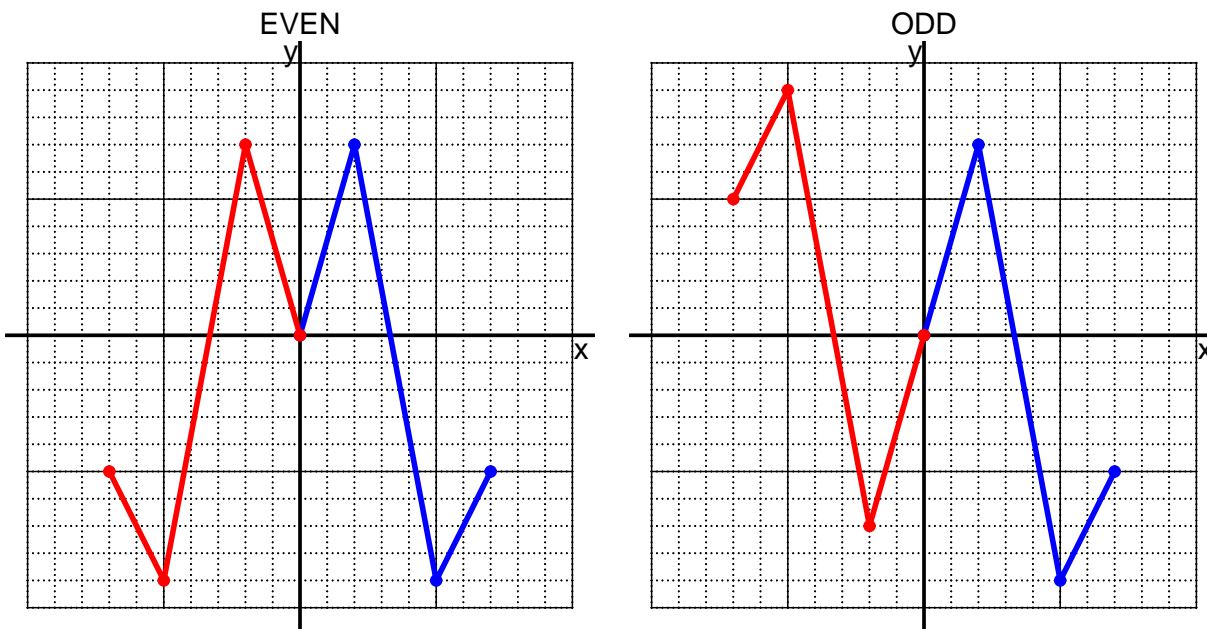
odd

- d. Explain how you know the answer to part c.

We see that  $p(x) = -p(-x)$  for all  $x$  because  $p(x)$  and  $-p(-x)$  are equivalent polynomials. Thus function  $p$  satisfies the criterion for being an odd function.

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8. I have drawn half of a function. Draw the other half to make it even or odd.



9. Let function  $f$  be defined with the equation below.

$$f(x) = 2(x - 8)$$

a. Evaluate  $f(40)$ .

step 1: subtract 8  
step 2: multiply by 2

$$\begin{aligned} f(40) &= 2((40) - 8) \\ f(40) &= 64 \end{aligned}$$

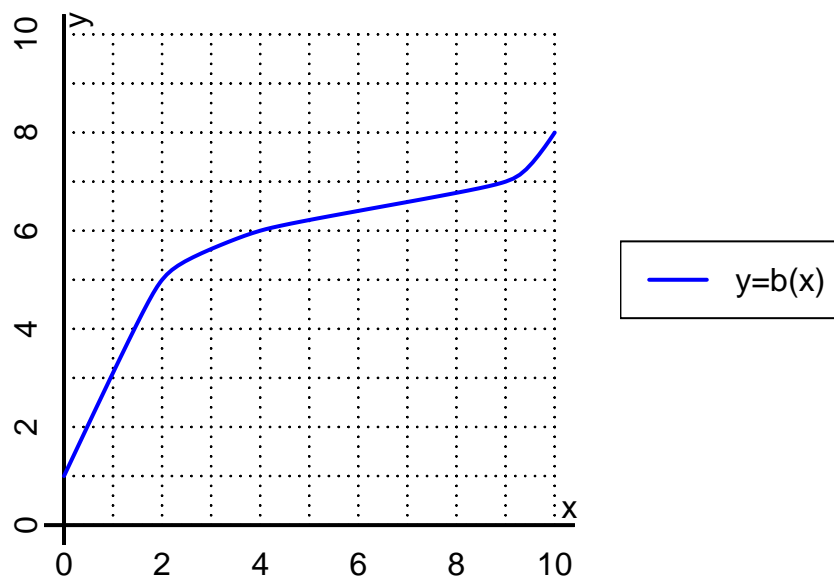
b. Evaluate  $f^{-1}(76)$ .

step 1: divide by 2  
step 2: add 8

$$\begin{aligned} f^{-1}(x) &= \frac{x}{2} + 8 \\ f^{-1}(76) &= \frac{(76)}{2} + 8 \\ f^{-1}(76) &= 46 \end{aligned}$$

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10. The function  $b$  is represented by the curve  $y = b(x)$  graphed below.



a. Evaluate  $b(2)$ .

$$b(2) = 5$$

b. Evaluate  $b^{-1}(6)$ .

$$b^{-1}(6) = 4$$

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11. Function  $f$  is defined by the table below.

a. Complete the columns for  $-f(x)$  and  $f(-x)$  and  $-f(-x)$ .

$x$	$f(x)$	$-f(x)$	$f(-x)$	$-f(-x)$
-2	-4	4	-4	4
-1	-6	6	6	-6
0	0	0	0	0
1	6	-6	-6	6
2	-4	4	-4	4

b. Is function  $f$  even, odd, or neither?

neither

c. How do you know the answer to part b?

Function  $f$  is neither because neither column  $-f(-x)$  nor column  $f(-x)$  matches column  $f(x)$  exactly.